DOCUMENT RESUME

ED 194 873 CS 005 716

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TITLE Radio and Television Reading Strategies.
INSTITUTION Pennsylvania State Dept. of Education, Harrisburg. Bureau of Vocational and Technical Education.: Pennsylvania State Univ., University Park. Div. of Occupational and Vocational Studies.
SPONS AGENCY Office of Education (DHEW), Washington, D.C.
PUB DATE 80
NOTE 105p.: Several charts may be marginally legible.

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS Cloze Procedure: Disadvantaged: *Functional Reading: Postsecondary Education: *Reading Difficulties: *Reading Improvement: Secondary Education: Teaching Guides: *Television Radio Repairers: Vocabulary Skills: Vocational Education

ABSTRACT

This instructional guide was developed to assist vocational teachers of radio and television maintenance in their work with students who are considered disadvantaged because of reading deficiencies. The six sections of the guide contain examples of several strategies believed to be useful for the vocational instructor seeking methods that are specifically related to radio and television instruction. These sections discuss readability procedures, the cloze procedure, basic vocabulary skills, paragraph comprehension, the SQ4R study method, and recognizing and recording complex information. Fourteen exercises are offered for applying the information to radio and television classrooms. (RL)

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RADIO AND TELEVISION READING STRATEGIES

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1980

CS805716

FORWARD

Education amendments in 1976 (P.L. 94-482) provide for special assistance to a wide variety of students with "special needs." The special needs of these students are derived from conditions of the students which are believed to inhibit success in vocational programs. Both handicapped and disadvantaged individuals are to be served by the legislative provisions.

Academically disadvantaged students are those individuals who, because of math, reading, or communication deficiencies, may not be able to succeed in vocational programs. Legislation has provided for research and development projects to address the needs of these individuals. The projects in progress have been designed to respond to that call for research and development.

This instructional guide was developed for the purpose of assisting Radio and Television Teachers in their work with students who are considered disadvantaged because of reading deficiency. It was developed as a result of vocational reading research at The Pennsylvania State University. The guide is intended to be field tested in selected classrooms in 1980 funded by the Pennsylvania Department of Education.

"Radio and Television Reading Strategies" have been developed according to certain distinct characteristics of reading requirements in vocational education:

(1) Reading is a vocational skill, one that requires reading abilities that differ from those associated with general literacy.

(2) There is a difference between curricular literature (textbooks and other literature which must be read in the context of student status) and occupational literature (manufacturers instructions, codes, specifications, safety warnings, etc.).

(3) Occupational reading skills are appropriately addressed in the vocational curriculum.

(4) There are strategies available to vocational teachers which need little or no reading specialization.

(5) Available strategies reflect the unique qualities of vocational reading, address general vocational reading skill requirements. and are useful for helping students disadvantaged because of reading deficiencies.

This guide is NOT intended to be envisioned as the final word in reading strategies. It contains examples of several strategies believed to be useful for the vocational instructor seeking methods that are specifically related to radio and television instruction. The instructors are responsible for taking these examples and applying them to their occupational specialties. Not all of the methods will work for all radio and television teachers

or their respective students. The methods were designed to be adapted, not rigidly adhered to.

Companion R & D projects at Penn State will provide useful complementary aids. An Employability Skills Curriculum Guide (Wircenski, McPherson, Feng, 1980) will soon be available. That guide addresses socialization, financial management, values clarification, job procurement, and communication skills. Four other occupational specialties (Carpentry, Cosmetology, Data Processing, and Medical Assisting) will be the bases for reading strategy guides (Thornton, 1980). These guides will focus more specifically on the repsective individual occupational areas utilizing a format similar to the radio and television guide.

Field testing during 1980-81 school year is expected to result in additional refinements of the several reading strategies. Criticism and recommendations are invited by all who receive these materials. Correspondence should be addressed to

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L. Jay Thornton
Project Director
1980

ACKNOWLEDGEMENTS

The Reading Strategies in Vocational Education Series, of which this book is one part, has resulted from research conducted by the Division of Occupational and Vocational Studies, The Pennsylvania State University and the Bureau of Vocational Education, Pennsylvania Department of Education. Many people, not expressly identified as part of the project, have served willingly in the dispatch of its objectives. Appreciation is especially expressed to Mr. Wayne Grubb, Consultant for Disadvantaged and Handicapped, Bureau of Vocational Education, Pennsylvania Department of Education, for his support and procedural advice.

Fifteen Area Vocational-Technical Schools in the Center Region of Pennsylvania participated in the development of the series. Scores of manufacturers, publishers, and employers provided literature and information. A listing of the schools, manufacturers, publishers, and employers follows. The project would have been impossible without their help.

Two research efforts provided considerable information toward the development of the series. The first, Basic Reading Skills and Vocational Education, was published by the National Center for Research in Vocational Education under the auspices of the Knowledge Transformation Project. That publication was supervised by Dr. Carol P. Kowle. The second, Review and Synthesis

of Reading In Vocational Education, was published by the Division of Occupational and Vocational Studies in conjunction with the Division of Education Administration Policy Studies and The Pennsylvania Department of Education. Both titles are available directly from their respective publishers.

Appreciation is expressed to Mrs. Laura Frye for her careful attention to the typing and proofreading of not only the final drafts of each title in the series, but all the preliminary work and intervening drafts required. The secretarial assistance of Rosann Moore, Peggy Kresovich and Sharon Brode in the typing of manuscripts is especially appreciated.

DISCLAIMER

The activity which is the subject of this report was supported in whole or in part by the U.S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education, and no official endorsement by the U.S. Office of Education should be inferred.

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SECTION 1

READABILITY

In order to plan for intervening in situations of reading deficiency, several pieces of information are required. First, it must be known how urgent the need to read actually is, in the context of both curriculum and occupational requirements. This does not suggest that reading, in the general literacy sense, may not be important. Educators clearly recognize that reading ability is crucial if learning is to occur. What this first question addresses is an examination of objectives and their component tasks to ascertain how much reading is required to complete the tasks and, ultimately, the objectives of the course.

Although there has been no research to date to distinguish between curricular and occupational reading requirements (Reference Note[1]) it is not difficult to visualize differences between textbook reading and, for example, manufacturers maintenance manuals. When Gerrish and Dugger (1977) advised students: "There are many variations to the basic tube checker...Detailed instructions will always be found in the manual supplied with the tester" (p. 288), it was intended that the student of radio and T.V. read this literature. That directive identifies two kinds of reading: that which is required to read the Gerrish and Dugger textbook (curricular) and that required to read the manufacturer's instructions (occupational). Previous research (De.W. Smith, 1974; Thornton, 1977; Thornton, 1979; Thornton, 1980) suggests that there could be significant differences in the readability level of sections of textbooks dealing with specific tasks and the readability level of literature pertaining to the performance of those tasks.

It is a fact that reading literature peculiar to an occupational specialty at least implies that some form of reading is a vocational skill. Thus, the second bit of information must be collected. It must be known (or decided) if the teacher, the school, and the school district intend to address reading within the vocational curriculum or as prerequisite skill. If reading is to be dealt with in the vocational curriculum, then all students must receive some form of vocational reading instruction. If, however, reading skill is envisioned to be prerequisite then the thrust of reading in vocational settings would be toward dealing with deficiences. The strategies, in the latter situation, would be individualized and delivered on a case by case basis.

The previous two pieces of procedural information are fairly general; the third and fourth are specific. The third deals with how difficult literature in a specific occupational curriculum is to read. What is the readability level? The fourth deals with how able students are in terms of reading ability. Can students read literature necessary to succeed in a vocational program? We shall deal with these issues separately.

Readability Procedures

Readability procedures are devices to estimate the grade reading level (GRL) of selected pieces of literature. In other words, a readability analysis determines the approximate GRL a person must possess in order to read the literature analyzed. Not the underlining of estimate and approximate. It must be cautioned

that, although these procedures have been validated by extensive research, they are not the sole determinants of readability. Muncrief (1975) discussed a variety of other considerations that are involved in readability assessments. For our purposes of matching literature assessment to student ability an index of readability is a useful measure.

There is a second caution needed about readability procedures. Preliminary results of current research (Reference Note[2]) brings up serious questions about trying to find an average readability level of occupational literature. For example, what does it mean that the average (the word "mean" is normally substituted for the word "average") readability level of a textbook is ninth (9th) grade? Because the word average or mean is used, it can be assumed that some of the literature is higher than ninth and some of it lower. What the average does not tell us is the range of readability levels and the concentration (mode at any level) of readability level.

In order to make sense out of that argument, a little must be known of how readability assessments are done. When analyzing a textbook (or any other lengthy piece of literature) random samples are selected. These samples are analyzed and an average of all of their readability levels is calculated. That average is the mean readability level of the literature. We will get more explicit about how this is done in the next section.

To point out the problem with using the mean (average) some hypothetical samples have been graphed below. The graphs show the

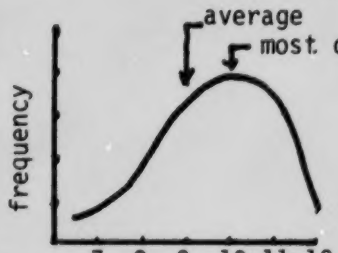
curve which would result if the frequencies of grade level of samples were plotted on the graph. The vertical axis of the graphs represents the frequency that samples were found to be at a particular grade level. The horizontal axis represents the specific grade levels. (See Figure 1)

All of the preceding graphs are of books at the ninth grade readability level. But they all differ in the concentration (mode) of levels. The point here is simply that the mean or average can be a deceptive statistic. The analysis can still be useful, providing the results include the range and distribution of readability scores sampled.

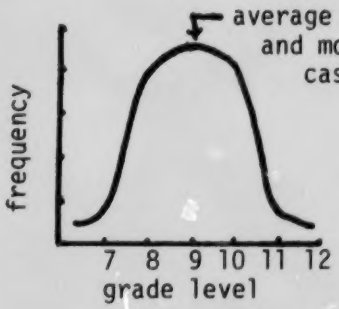
Two readability procedures will be discussed: (1) Fry procedure (See Figure 2); and (2) Flesh procedure (See Figure 3).

A form for calculating has been included to simplify the Flesh Formula calculations. (See Figure 4)

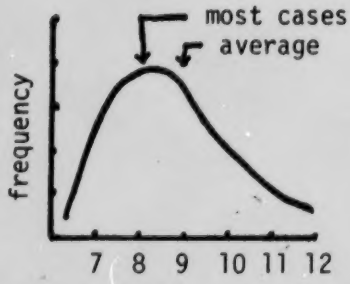
Figure 1: Sample Readability Graph



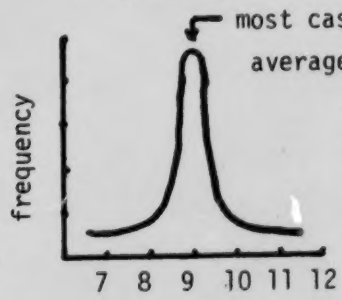
(most cases above 9th)



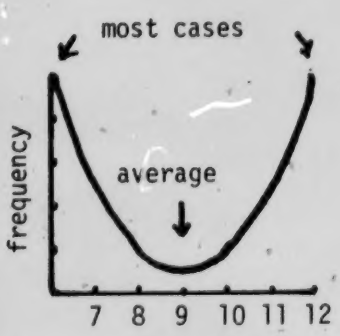
(most cases at 9th substantial variability)



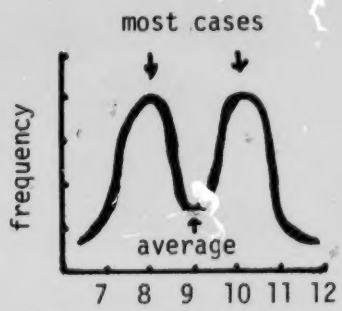
(most cases below 9th)



(most cases at 9th slight variability)



(most cases at highest and lowest levels)



(most cases one grade higher and lower than average)

Figure 2: GRAPH FOR ESTIMATING READABILITY
by Edward Fry, Rutgers University Reading Center, New Jersey
Average number of syllables per 100 words

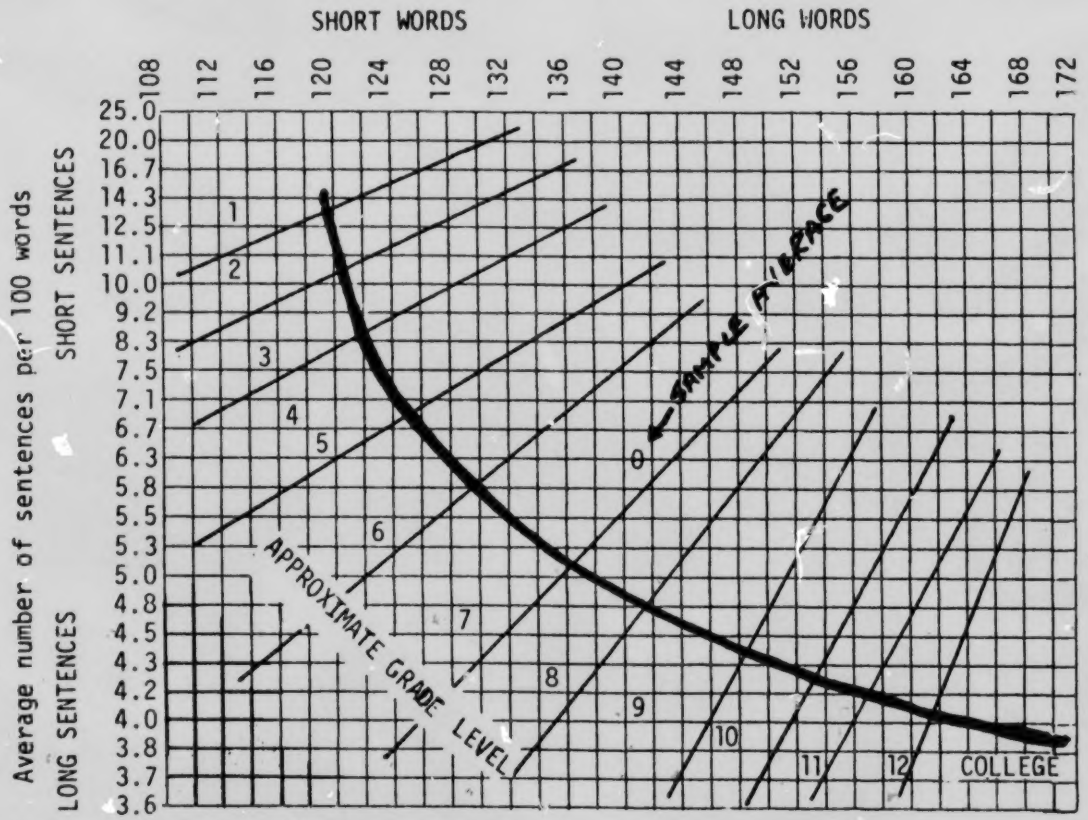


Figure 2 (Continued)

Directions: Use a stratified random procedure, at least five percent for books, more for shorter materials. For example: If a book is 350 paces long, five percent equals 17.5. 350 ÷ 17.5 equals 20. Select a starting number, for example: 6. The first sample page is 6; then 26; then 46; then 66; etc. If one of the pages has no text proceed one page at a time forward until a page is found from which a sample can be taken.

From each of these pages select 100 word passages (alternate positions on page from which taken. For example: beginning, middle, ending). Plot the average number of syllables and average number of sentences per 100 words on the above graph.

This will give you the average readability of the book.

Example:

	Syllables	Sentences
First 100 Words	124	6.6
Second 100 Words	141	5.5
Third 100 Words	158	6.3
Average	141	6.3

Then plot the syllables and sentences for each sample. This will illustrate the range of readability for the literature being analyzed.

(For further information and validity data, see April, 1968 Journal of Reading and March, 1969 Reading Teacher.)

Figure 3: FLESH READABILITY FORMULA PROCEDURE

There is one readability procedure that is easily used with the assistance of a simple calculator. The Rudolph Flesh (1949) Readability Formula involves a count of the syllables in the sample and words per sentence in conjunction with a mathematical formula. The result is a "Reading Ease Score" which translates into grade reading level.

I. 1. Count the words in the sample (100 words or more, if available).
2. Count the number of sentences.
3. Divide the total number of words by the total number of sentences.
4. Multiply that total (average number of words in a sentence) by 1.015.

II. 1. Count the syllables in the sample.
2. Multiply the number of syllables by 100.
3. Divide that total by the number of words in the sample.
4. Multiply that total by .846.

III. Add I and II.

IV. Subtract III from 206.835.
That is the reading ease score. It translates accordingly:

R.E.Score	Grade	R.E.Score	Grade
115-120	1	80- 89	6
110-114	2	70- 79	7
105-109	3	60- 69	8.5
100-104	4	50- 59	11
90- 99	5	30- 49	14.5
		0- 29	College Grad.

Flesh, Rudolph. The Art of Readable Writing. New York: Harper and Brothers, 1949.

Figure 4: Flesh Readability Procedure Form

Textbook_____ Publisher_____

Pg.#	#Wds. ÷ #Sent	X	x 1.015	#Syl	x 100 ÷ #Wds.	Y	x .846

Figure 4 (Continued)

	Minus (x + y)	R.E. Score
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
206.835		
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206.835		
206.835		
206.835		
206.835		

R.E. Score	Grade
115-120	1
110-114	2
105-109	3
100-104	4
90-99	5
80-89	6
70-79	7
60-69	8.5
50-59	11
30-49	14.5
0-29	College Grad.

The textbook sample in Figure 5 demonstrates the rules.

Instructions for Calculations

WORD COUNT - Fry: Count all words up to 100 words (may end in partial sentence.) Flesh: Count all words up to approximately 100 (end of full sentence).

Numbers - such as 30, 1951, 27-A, L78G are each counted as one word.

Hyphenated words - one word.

Abbreviations - one word

Acronyms - such as PVA, NSU, USA, AVA are each counted as one word.

SENTENCES - Fry: Count the sentences and determine the tenth of a sentence when ending in a partial sentence. Flesh: Count all sentences.

Headings (paragraph headings) - one sentence.

Parenthetical expression - (enclosed in brackets) is one sentence even if contained in another sentence.

Semi-colon or colon - If there is a semi-colon or colon in what we usually consider a sentence, that is considered to be another sentence. The easiest way to handle that is to count one sentence overall and add one sentence - count for each colon or semi-colon in the sentence.

RECORDING - Fry: Write down the number of sentences per 100 words. In the example the 100th word is "broadcast." There are 9 full sentences, plus the partial sentence ending in "broadcast." There are 14 words up to and including "a" and 21 words in the

FIGURE 5: SAMPLE WITH WORD COUNT OVER WORDS

1 2 3 4 5 6 7 8
THE ELECTRONIC TUNER PERFORMS THE SAME BASIC PURPOSE

9 10 11 12 13 14 15 16
AS DO PRESENT MECHANICAL WAFER SWITCH OR ROTARY

17 18 19 20 21 22 23
DRUM TYPE DEVICES. HOWEVER, BAND CHANGING IS

24 25 26 27 28 29 30
ACCOMPLISHED BY AN ENTIRELY DIFFERENT METHOD. BEFORE

31 32 33 34 35 36 37
COVERING THE DETAILED OPERATION OF THE ELECTRONIC

38 39 40 41 42 43
TUNER, LET'S REVIEW PRESENT TUNER FUNDAMENTALS.

44 45 46 47
1) FUNCTION AND CONSTRUCTION.

48 49 50 51 52 53 54 55 56
TUNERS SELECT AND CONVERT VHF AND UHF CHANNELS INTO

57 58 59 60 61 62
A COMMON LOW FREQUENCY (INTERMEDIATE FREQUENCY)

63 64 65 66 67 68
SIGNAL FOR EFFICIENT AND ECONOMICAL RECEIVER

69 70 71 72 73 74
PROCESSING. TUNERS GENERALLY CONTAIN THE FOLLOWING

75 76
THREE CIRCUITS:

77 78 79 80 81 82 83
A) HIGH-FREQUENCY AMPLIFIER TO SELECT AND AMPLIFY

84 85 86
EACH BROADCAST CHANNEL.

87 88 89 90 91 92 93
B) LOCAL OSCILLATOR CIRCUIT THAT PRODUCES THE

FIGURE 5 (CONTINUED)

94 95 96 97 98 99 100
NECESSARY MIXING SIGNAL TO CONVERT THE BROADCAST

101 102 103 104 105 106 107
CHANNEL INTO THE COMMON INTERMEDIATE FREQUENCY SIGNAL.

QUINTRIX II TRAINING MANUAL, VOL. 9 ELECTROTUNE. SECAUCUS, NEW JERSEY: PANASONIC COMPANY, DIVISION OF MATSUSHITA ELECTRIC CORPORATION OF AMERICA, P.2.

sentence. Divide 14 by 21 (14 ÷ 21). That result is approximately .66 and rounds to 0.7. Therefore, for the Fry sentence count there are 9.7 sentences per 100 words. Flesh: Count to the end of the sentence in which the 100th word occurs. Therefore, there are 107 words and 10 sentences. Enter these figures on the form and complete the math involved.

SYLLABLES - Syllables are counted in the same way for each procedure. An easy way is to count only those syllables over 1 for each word. For example:

1 2 3 4 5
The e/lec/tro/nic tun/er per/forms the same ...

Complete the counting for the entire passage in the same manner. Your total then is added to the total number of words (100 for Fry; 107 for Flesh, in this example). That gives you the total syllable count.

RECORDING - Fry: Write down the total number of syllables. On the graph plot the total syllables (across) to the number of sentences per 100 words. That will give you the approximate readability level of that passage. Flesh: Write down the number of syllables in the space on the form and complete the mark as noted. Then add x and y and subtract that figure from 206.835. That is the Reading Ease score and translates to grade level on the chart.

The total sample syllable count and results for Flesh and Fry methods follow in Figure 6.

FIGURE 6: SAMPLE TEXT
WITH SYLLABLES MARKED

THE E/LEC/TRON/IC TUN/ER PER/FORMS THE SAME BAS/IC PUR/POSE AS DO PRES/ENT MECH/AN/I/CAL WAF/ER SWITCH OR RO/TAR/Y DRUM TYPE DE/VIC/ES. HOW/EV/ER, BAND CHANG/ING IS AC/COM/PLISHED BY AN EN/TIRE/LY DIF/FER/ENT METH/OD. BE/FORE COV/ER/ING THE DE/TAILED O/PER/A/TION OF THE E/LEC/TRON/IC TUN/ER, LETS RE/VIEW PRES/ENT TUN/ER FUN/DA/MEN/TALS.

1) FUNC/TIONS AND CON/STRUC/TION

TUN/ERS SE/LECT AND CON/VERT V/H/F AND U/H/F CHAN/NELS IN/TO A COM/MON LOW FRE/QUEN/CY (IN/TER/MED/I/ATE FRE/QUEN/CY) SIG/NAL FOR EF/FI/CIENT AND E/CO/NOM/I/CAL RE/CEIV/ER PRO/CESS/ING. TUN/ERS GEN/ER/AL/LY CON/TAIN THE FOL/LOW/ING THREE CIR/CUITS.

A) HIGH/-FRE/QUEN/CY AM/PLI/FI/ER TO SEL/ECT AND AM/PLI/FY EACH BROAD/CAST CHAN/NEL.

B) LO/CAL OS/CIL/LA/TOR CIR/CUIT THAT PRO/DUC/ES THE NE/CES/SAR/Y MIX/ING SIG/NAL TO CON/VERT THE BROAD/CAST CHAN/NEL IN/TO THE COM/MON IN/TER/MED/I/ATE FRE/QUEN/CY SIG/NAL.

NOTE THAT FOR NUMBERS AND ACRONYMS, EACH LETTER (NUMBER) COUNTS AS A SYLLABLE.

The following results were obtained from readability analyses of the preceding sample.

Fry:

100 words

9.7 sentences

202 syllables

Unable to determine, but well above college level.

Flesh:

107 words

10 sentences

219 syllables

R.E. Score 8.57

Above scale; well above college graduate.

Exercise 1

Following are three examples selected from other sections of the same literature. Practice the procedure, marking syllables and sentence count directly on the samples.

Exercise 1 Sample 1

Tuning Variation

Fig. 1-4 illustrates the relationship between the tuning circuit (L, Zt, C) and the applied tuning voltage through VR. This variable voltage determines the capacitance of diode (Zt) and thus changes the resonance of the tuning circuit. As the tuning voltage increases, the capacitance decreases causing the resonant frequency of the total network to increase. In a practical circuit, control would be pre-set to tune a particular channel. The number of VR's 8, 12 or 20 would be equal to the numbers of receivable TV broadcast signals. All the control's are connected in parallel with their respective vari-cap diodes.

(Quintrix II Training Manual, Vol. 9 Electrotune. Secaucus, New Jersey: Panasonic Company, Division of Matsushita Electric Corporation of America, p. 4)

Exercise 1 Sample 2

Band Change Circuitry

The band changing circuitry consists of 2 coils, one for low channels (CH2-6) and the other for high channels (CH7-13). They are both connected in series as shown in Figs. 1-5-A and B. The circuit in A indicates basic mechanical band changing. When the switch is in position L, the circuit contains L1 and L2 = Low frequency tuning. When the switch is in position H, L2 is shorted = High frequency tuning, less inductance.

The electronic tuner utilizes electronic band changing circuitry. This consists of a diode Ds and capacitor Cs as indicated in Fig. 1-5B.

(Quintrix II Training Manual, Vol. 9 Electrotune. Secaucus, New Jersey: Panasonic Company, Division of Matsushita Electric Corporation of America, p. 4)

Exercise 1 Sample 3

D) The remote control channel selector system allows only one channel change when the remote control UP or DOWN buttons are pressed. This type of design assures positive one channel change in either direction without skipping that desired channel. When either the UP or DOWN channel button is pressed, the output signal of NAND-3 becomes "1" at Pin (3), causing NAND-2 output at Pin (8), to become "0". The output signal of NAND-2 is connected to 1C1302 Pin (10) through D1334.

This circuit design allows only one pulse to be generated when the level of Pin (10) of 1C2302 becomes "0". Therefore, only one channel change occurs during the remote control process.

(Quintrix II Training Manual, Vol. 9, Electrotune, Secaucus, New Jersey: Panasonic Company, Division of Matsushita Electric Corporation of America, p. 17)

SAMPLES: HOW SELECTED AND HOW MANY

It is important, if an accurate picture of the literature is to be obtained, that the samples to be analyzed be selected at random. Too many subjective errors would be introduced by merely paging through the book, picking what appears to be representative samples. The easiest way and one that is sufficiently random is entitled a stratified random sampling.

In order to achieve the stratified random sample, it must first be decided how many samples are to be drawn. A useful rule is to select samples from 5% of the pages in the book. Remember, however, that the more samples drawn, the more accurate will be the analysis. That point is demonstrated in the following analyses (See Figure 7) of a textbook under consideration in which 3, 6, 10, 15 were drawn. (Average was used in this case to distinguish between results of analyses in which increasing numbers of samples were drawn.)

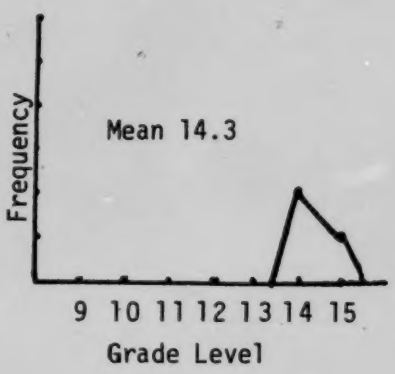
It is recommended that 5% sample or more be drawn for accuracy.

Procedure: Assume a book has 300 pages (not including glossary or index). A 5% sample requires (.05 x 300) 15 samples. To establish the starting page divide the total pages (300) by the total samples required (15). That result is 20. Randomly pick a number from 1-20. This can be done using numbers in a hat. That number is the starting page. Let's assume it is 6. The remainder

Figure 7: Sample Graphs of GRL Frequencies: 3, 6, 10, 15 Samples

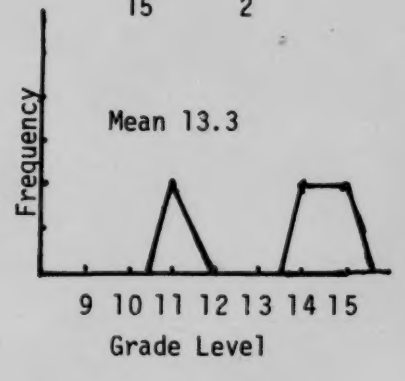
GRL	Freq.
14	2
15	1

Mean 14.3



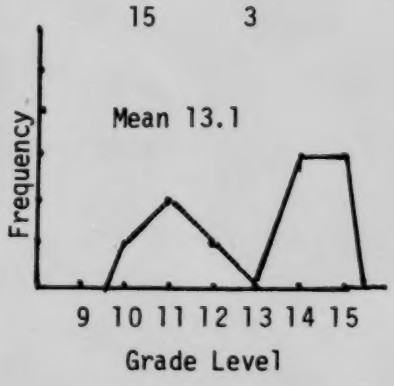
GRL	Freq.
11	2
14	2
15	2

Mean 13.3



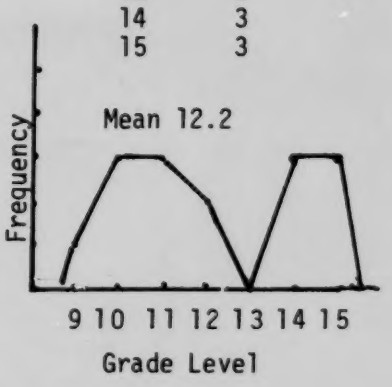
GRL	Freq.
10	1
11	2
12	1
14	3
15	3

Mean 13.1



GRL	Freq.
9	1
10	3
11	3
12	2
14	3
15	3

Mean 12.2



of the pages are selected by adding 20 to 6, 20 to 26, 20 to 46, etc. until all the samples are drawn.

Now we know the pages of the book we will use in the analysis. If any of those pages contains no text (some may be pictures or diagrams) move one page at a time forward or backward until text is found. It is also recommended that the sample 100 words be selected alternatively from the beginning (B) and end (E) of the page. Therefore, page 6 would be 6-B (for beginning), page 26-E (for end), page 46-B, etc.

Exercise 2

Compute a stratified random sample schedule for the following:

1. Textbook with 350 pages.
2. Textbook with 1000 pages.
3. Textbook with 525 pages.

If the literature you plan to analyze contains less than 200 pages, but more than 25, select 10 samples. For literature of less than 25 pages, but more than 5, select every other page. For literature less than 5 pages, take a sample of every page.

On the following page (See Figure 8) is a form to assist you in recording your findings. It is always a good idea to keep a file of literature analyzed.

Figure 8: Readability Record

Author(s):

Title of Literature:

Publisher:

Publication Data:

Total Number of pages:

Percent of pages sampled:

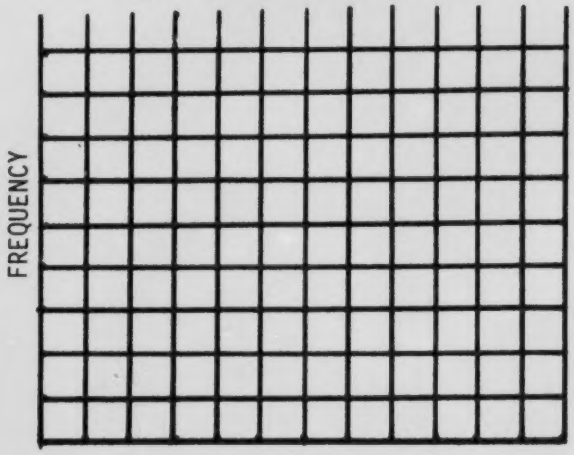
Procedure used:

Page numbers from which samples were taken:

Highest readability:

Lowest readability:

Graph for Plotting Results



SECTION 2

CLOZE PROCEDURE

STUDENT READING ABILITY

Diagnostic reading test scores are often available for students in vocational programs. These scores, normally on file at the home school (in the counselors office at the comprehensive high school), are useful indicators of a student's general reading ability. How well they relate to vocational reading requirements is subject to conjecture. There simply has not been a concerted effort to separate vocational reading skill from general literacy skill. Because of these unknowns it is strongly recommended that you not accept a GRL score as final. Standardized reading test scores are useful indicators, but they should be supplemented with teacher made vocational reading tests.

A useful and highly adaptable reading test is the cloze procedure.

> The cloze procedure is an objective measure of language correspondence between reader and writer. It consists of a cloze (word) unit, a single occurence of a successful attempt to reproduce accurately a part deleted from a message, by deciding from the context that remains what the missing part should be (Taylor, 1953).

> The cloze procedure differs from vocabulary contextual texts. Rather than choosing omitted words because of definition and purpose, the cloze units are chosen mechanically; every fifth word, for example, occurring at any point in a continuous passage is omitted. The cloze design incorporates control against misrepresenting strength/weakness in content vocabulary as an indication of the test subject's ability/inability to read (Thornton, 1979).

Any piece of literature can be clozed. That includes textbooks, occupational literature, safety messages, codes, medical contraindications, literally anything. The procedure is described below:

1. Select a piece of literature.
2. Leave the first sentence intact.
3. Delete every fifth word.
4. Leave the last sentence intact.
5. Instruct the student to read the entire passage first, then begin filling in the blanks.
6. Instruct the student to be aware when guessing is the rationale for word selection, but to guess when other rationale fails.

Scoring the test is accomplished as follows:

0-39.9% Frustrational level (Student will not be able to read the literature)

40.0-69.9% Instructional level (Student will require intervention to be able to read the literature)

70.0-100.0% Independent level (Student is able to read the literature without intervention)

On the following pages five different cloze tests have been prepared using on-the-job literature. The correct words which have been deleted are listed following each example.

FIGURE 9: TELEVISION SERVICING SAFETY PRECAUTIONS

1. IT IS ADVISABLE TO INSERT AN ISOLATION TRANSFORMER IN THE POWER LINE AND AC SUPPLY BEFORE SERVICING A HOT CHASSIS.
2. WHEN SERVICING, OBSERVE _____ ORIGINAL LEAD DRESS; ESPECIALLY _____ LEAD DRESS IN THE _____ VOLTAGE CIRCUITS. IF A _____ CIRCUIT IS FOUND, REPLACE _____ PARTS WHICH HAVE BEEN _____ OR DAMAGED BY THE _____ CIRCUIT.
3. AFTER SERVICING, _____ TO IT THAT ALL _____ PROTECTIVE DEVICES SUCH AS _____ BARRIERS, INSULATION PAPERS, SHIELDS, _____ ISOLATION R-C COMBINATIONS, ARE _____ INSTALLED.
4. BEFORE TURNING _____ RECEIVER ON, MEASURE THE _____ BETWEEN B+ LINE AND _____ GROUND. CONNECT - SIDE _____ AN OHMMETER TO THE _____ LINES, AND + SIDE _____ GROUND. EACH LINE SHOULD _____ MORE RESISTANCE THAN SPECIFIED, _____ FOLLOWS:

B+Line	Minimum Resistance
115V	12KΩ
40V	5KΩ
12V	220Ω

FIGURE 9 (CONTINUED)

5. WHEN THE _____ SET IS NOT TO _____ USED FOR A LONG _____ OF TIME, UNPLUG THE _____ CORD SHOULD FROM THE _____ LINE OUTLET.
6. POTENTIALS _____ HIGH AS 24KV ARE _____ WHEN THIS RECEIVER IS _____. OPERATION WITHOUT THE REAR _____ PRESENTS A DANGER OF _____ HAZARD DANGER FROM THE _____ POWER SUPPLY. SERVICING SHOULD _____ BE ATTEMPTED BY ANYONE _____ IS NOT THOROUGHLY FAMILIAR _____ THE PRECAUTIONS THAT SHOULD _____ TAKEN WHEN WORKING ON _____ EQUIPMENT. ALWAYS DISCHARGE THE _____ OF THE PICTURE TUBE _____ THE RECEIVER CHASSIS BEFORE _____ THE TUBE.
7. AFTER SERVICING MAKE THE FOLLOWING LEAKAGE CURRENT CHECKS TO PREVENT THE CUSTOMER FROM BEING EXPOSED TO SHOCK HAZARDS.

SERVICE MANUAL, COLOR TELEVISION, CT-117, CHASSIS, NO. NMX-K4A, MAIN MANUAL. SECAUCUS, NEW JERSEY: PANASONIC COMPANY, P. 3.

FIGURE 9 (CONTINUED)

THE	RESISTANCE	PRESENT
THE	CHASSIS	OPERATING
HIGH	OF	COVER
SHORT	B+	SHOCK
ALL	TO	RECEIVER
OVERHEATED	HAVE	NOT
SHORT	AS	WHO
SEE	TV	WITH
THE	BE	BE
INSULATION	PERIOD	HIGH-VOLTAGE
AND	POWER	ANODE
PROPERLY	AC	TO
THE	AS	HANDLING

FIGURE 10: AUTO RADIO SERVICE CLOZE TEST

■ RADIATION ROUTE OF NOISE CAUSED BY ELECTRIC DEVICES

NOISE GENERATED FROM ELECTRIC _____, WHICH CONTAINS HIGH-FREQUENCY COMPONENT, _____ RADIATED IN ALL DIRECTION _____ VARIOUS ROUTES AND INTRODUCED _____ CAR RADIO OR CAR _____.

THESE ROUTES HAVE TWO _____; ONE IS DIRECT RADIATION _____ THE OTHER SECONDARY RADIATION.

● _____ RADIATION: NOISE RADIATED DIRECTLY _____ NOISE SOURCE IS INTRODUCED _____ RADIO OR CAR STEREO _____ VARIOUS OBJECTS SUCH AS _____ (INCLUSIVE OF FEEDER), POWER _____, BODY OF CAR RADIO _____ CAR STEREO, ELECTRIC CORDS _____ BODY, ETC. IT IS _____ INTRODUCED THROUGH THE POWER _____ OF CAR RADIO OR _____ STEREO TO WHICH THE _____ SOURCE IS CONNECTED.

● SECONDARY _____: NOISE RADIATED DIRECTLY FROM _____ SOURCE IS PICKED UP _____ METALLIC OBJECTS OR ELECTRIC _____ (NOT DIRECTLY CONNECTED TO _____ SOURCE) AND AGAIN

FIGURE 10 (CONTINUED)

RADIATED _____ SUCH OBJECTS, THUS BEING _____ CAR RADIO OR CAR _____. THE MAJOR SOURCES OF _____ RADIATION ARE BONNET OF _____ ROOM AND CHOKE WIRE.

_____ A RARE CASE, THE _____ OF SECONDARY RADIATION IS _____ THAN THAT OF DIRECT _____. THIS IS BECAUSE OF THE FACT THAT THE SOURCE OF SECONDARY RADIATION SOMETIMES HAS GREATER RADIATION EFFECT.

HOW TO SUPPRESS CAR NOISE. SERVICE HANDBOOK, VOL.2 NEW YORK: PANASONIC COMPANY, P. 6.

FIGURE 10 (CONTINUED)

DEVICE	ANTENNA	WIRING
IS	CORD	NOISE
THROUGH	OR	FROM
INTO	FROM	INTRODUCED
STEREO	ALSO	STEREO
TYPES	CIRCUIT	SECONDARY
AND	CAR	ENGINE
DIRECT	NOISE	IN
FROM	RADIATION	STRENGTH
CAR	NOISE	LARGER
THROUGH	BY	RADIATION

FIGURE 11: POWER ANTENNA SERVICE CLOZE TEST

GENERAL DESCRIPTION:

THE "SLIM LINE" TYPE ANTENNAS ARE A COMPLETELY NEW DESIGN AND DIFFER CONSIDERABLY FROM PREVIOUS MODELS BOTH IN PHYSICAL APPEARANCE AND INTERNAL CONSTRUCTION. AS SHOWN _____ FIGURE 1, A PLASTIC _____ CONSISTING OF TWO HALVES _____ ATTACHED TO THE MAST _____ TUBE ASSEMBLY. THE HOUSING _____ THE PERMANENT MAGNET MOTOR _____, LIMIT SWITCH ASSEMBLY, DRIVE _____ AND DRIVE CABLE STORAGE _____. SEALER IS USED BETWEEN _____ TWO HOUSING HALVES TO _____ WATER ENTRY AND THEY _____ HELD TOGETHER WITH 5 _____ ON CLIPS AND 4 _____.

THE MOTOR ARMATURE IS _____ BY AN AUTOMATIC RESET _____ CIRCUIT BREAKER WHICH IS _____ ON THE LIMIT SWITCH _____.

ANTENNA TYPES:

TWO BASIC _____ ARE SUPPLIED DEPENDING ON _____ TYPE OF RADIO INSTALLED _____ THE CAR:

1) AM-FM _____

2) AM-FM-CP (TRI-BAND) TYPE

FIGURE 11 (CONTINUED)

_____ SHOWN IN FIGURE 1, _____ TWO BASIC TYPES OF _____ ARE VERY SIMILAR IN _____. HOWEVER, THE "TRI-BAND" (AM-FM-CB) _____ HAS A LOAD COIL _____ A LENGTH OF RF _____ ATTACHED TO THE SUPPORT _____ WHICH ACTS AS A _____ ANTENNA. THE STUB ANTENNA PROVIDES IMPROVED FM RECEPTION AND SHOULD NOT BE DISCONNECTED EXCEPT WHEN ANTENNA REQUIRES SERVICE.

SERVICE MANUAL FOR "SLIMLINE" TYPE, DELCO PRODUCTS POWER ANTENNAS. BULLETIN 27D-2. DAYTON, OHIO: DELCO PRODUCTS, DIVISION OF GENERAL MOTORS CORP., OCTOBER 1978, P.3.

FIGURE 11 (CONTINUED)

IN	ARE	TYPE
HOUSING	SNAP	AS
IS	EYELETS	THE
AND	PROTECTED	ANTENNA
CONTAINS	TYPE	CONSTURCTION
PARTS	LOCATED	TYPE
GEAR	ASSEMBLY	AND
SPOOL	TYPES	CABLE
THE	THE	TUBE
PREVENT	IN	STUB

FIGURE 12: ELECTRONIC CIRCUITRY CLOZE TEST

ELECTRONIC CHANNEL SELECTOR CIRCUITRY

THE PRECEDING CHAPTER HAS INDICATED THE SEVERAL TYPES OF NECESSARY CONTROL VOLTAGES UNIQUE TO ELECTRONIC TUNERS. WE ALSO LEARNED _____ THE CIRCUITS REACT TO _____ APPLIED VOLTAGES. THIS CHAPTER _____ DEAL WITH THE CONTROL _____ CIRCUITRY, HOW IT IS _____, AND APPLIED TO THE _____ TUNER.

1) CIRCUITY AND _____

THE ELECTRONIC CHANNEL SELECTOR _____ CAN BE DIVIDED INTO _____ FUNCTIONING BLOCKS INCLUDING TUNING _____, BAND SWITCHING VOLTAGE, AND _____ B+ POWER. THE SYSTEM _____ BETWEEN THE CIRCUITS IS _____ IN FIG. 2-1. THE _____ EXPLANATION'S ARE REFERENCED TO _____ RECEIVER CT-977.

A) CHANNEL _____ DETECTOR CIRCUIT

THIS CIRCUIT _____ OF THE CHANNEL SELECTOR _____ BOARD AND THREE IC'S. _____ ANY ONE SWITCH ON _____ BOARD IS DEPRESSED, THAT _____ CHANNEL COMMAND IS DETECTED _____ STORED WITHIN

FIGURE 12 (CONTINUED)

THE CIRCUIT _____.

B) TUNING VOLTAGE SUPPLY _____

THIS CIRCUIT CONTAINS FOURTEEN _____ RESISTORS AND AMPLIFIER. ITS _____ IS TO ALLOW PRESETING _____ CORRECT (BT) TUNING _____ (DEPENDING ON THE DESIRED _____ CHANNEL) TO BE APPLIED _____ THE UHF OR VHF _____ TUNER.

C) VHF LOW/HIGH _____ SWITCHING CIRCUIT

THE VARACTOR _____ CIRCUITRY CANNOT TUNE THE _____ VHF BAND FROM ONE _____ VOLTAGE RANGE. THE VHF _____ WIDTH IS TOO WIDE. _____, THE VHF BAND HAS _____ DIVIDED INTO TWO SECTIONS_____ AN ELECTRONIC SWITCHING CIRCUIT. THIS CIRCUIT PRODUCES THE (BS) NECESSARY DEPENDING ON THE DESIRED CHANNEL. REFER TO THE PRECEDING CHAPTER FOR DETAILS.

OP. CIT. QUINTRIX 11 TRAINING MANUAL, P. 7.

FIGURE 12 (CONTINUED)

HOW	FOLLOWING	THE
THE	COLOR	VOLTAGE
WILL	SELECTION	BROADCAST
VOLTAGE	CONSISTS	TO
DERIVED	SWITCH	ELECTRONIC
ELECTRONIC	WHEN	BAND
FUNCTION	THESE	DIODE
CIRCUITY	SELECTED	ENTIRE
SIX	AND	(BT)
VOLTAGE	CONFIGURATION	BAND
UHF/VHF	CIRCUIT	THEREFORE
RELATIONSHIP	VARIABLE	BEEN
SHOWN	FUNCTION	BY

FIGURE 13: FIELD SERVICE CLOZE TEST

FIELD ALIGNMENT OF TELEVISION RECEIVER

A. WITHOUT TEST EQUIPMENT

ALIGNMENT _____ BE ACCOMPLISHED BY GENERAL _____. THE FOLLOWING DESCRIBES SIMPLE _____ METHODS THAT DO NOT _____ EXTENSIVE SERVICE SHOP TEST _____.

SOUND 1-F ALIGNMENT

1. _____ IN A STRONG CHANNEL, _____ SET THE AUDIO VOLUME _____ TO MID-POSITION.
2. ADJUST _____ FOR MAXIMUM VOLUME, AND _____ BUZZ.
3. TURN THE _____ TUNING CONTROL TO OBTAIN _____ SMEARY PICTURE AND POOR _____.
4. ADJUST T202 FOR _____ UNDISTORTED SOUND.
5. CHECK _____ CHANNELS FOR SATISFACTORY SOUND _____ PROPERLY ADJUSTED FINE TUNING.

_____ ALIGNMENT

1. SET THE _____ SWITCH IN THE OFF _____.
2. TUNE IN EACH _____ AND ADJUST THE FINE _____ CONTROL FOR BEST RECEPTION _____ COLOR, VIDEO AND AUDIO.

FIGURE 13 (CONTINUED)

_____ CHECK THE AFT HOLDING _____ BY SETTING THE AFT _____ IN THE ON POSITION _____ ROTATING THE FINE TUNING _____ ABOUT 90° CLOCKWISE, AND _____ 90° COUNTER-CLOCKWISE. PICTURE AND _____ SHOULD REMAIN CLEAR.

4. _____ ALL CHANNELS.

DELAYED AGC _____

1. TUNE IN A _____ CHANNEL.
2. TURN THE _____ CONTROL (R109) FULLY COUNTERCLOCKWISE, _____ THEN SLOWLY TURN IT _____ TO A POINT WHERE _____ NOISE IN THE PICTURE _____ DISAPPEARS.

SUB-TINT CONTROL ALIGNMENT

_____ TUNE IN A COLOR _____.

2. SET THE Q-LOCK _____ SWITCH IN THE OFF _____, AND THE TINT AND _____ CONTROLS IN THE CENTER _____ ROTATION.
3. ADJUST SUB-TINT _____ (R685) UNTIL PROPER FLESH _____ ARE OBTAINED.
4. CHECK ALL CHANNELS.

OP. CIT. SERVICE MANUAL, COLOR TELEVISION, P.5.

FIGURE 13 (CONTINUED)

CAN	WITH	ADJUSTMENT
PROCEDURES	AFT	LOCAL
ALIGNMENT	AFT	AGC
REQUIRE	POSITION	AND
EQUIPMENT	CHANNEL	CLOCKWISE
TUNE	TUNING	THE
AND	OF	JUST
CONTROL	3	1
T201	RANGE	PROGRAM
MINIMUM	SWITCH	11
FINE	AND	POSITION
A	CONTROL	COLOR
SOUND	THEN	OF
BEST	SOUND	CONTROL
ALL	CHECK	TONES

Exercise 3

Cloze the following passage and write out the instructions to the students regarding how they should proceed.

TRI-BAND (AM-FM-CB) LOAD COIL ADJUSTMENT

The load coils on Tri-Band antennas have an adjusting band that is factory adjusted and locked in place using "Loctite" (#222).

Normally the load coil should not require any further adjustment. However, if the CB radio transmitting performance is suspected to be below normal, make an SWR check before any adjustment is attempted.

SWR (STANDING WAVE RATIO) CHECK

NOTE: When making this check, car should be at least 20 feet away from any building, antenna must be fully extended, hood closed and no one should be standing close to the antenna.

1. Turn off ignition and CB radio.
2. Disconnect antenna lead from CB radio and attach it to the "antenna" socket on the SWR meter.
3. Connect on RF jumper cable between the CB radio and the transmitter socket on the SWR meter.
4. Turn on CB radio and make sure antenna is fully extended.
   Measurement from top of fender to tip of mast - approx. 36".
   Top section - from top of load coil to top of tip 11 1/4".

Op. Cit. Service Manual for "Slimline," p. 10.

Exercise 3: Answer Sheet

Instructions:

Words List:

The cloze procedure can also be used as a teaching technique. A variety of cloze modifications are useful for vocational teachers.

The changes in the procedure reflect the purpose of the exercise. If, for example, an occupational instructor wishes to highlight safe practices in a shop and be certain that the student reading safety literature understands what is being read, the passage can be "clozed," deleting those words which are critical to the safe practices comprehension. The following auto radio passage with "instructional modification" words (to be deleted) underlined illustrates the technique:

SAMPLE: INSTRUCTIONAL MODIFICATION CLOZE

NOISE FROM CAR RADIO OR CAR STEREO

Noise from car radio or car stereo makes the listener unpleasant. Such a noise is originated either from the outside of the set or from the inside of it. The noise from the outside is called the external noise and that from the inside the internal noise. The internal noise is due to the noise of defective parts (Example: dial illumination lamp).

In a rare case, it is caused by poor soldering of parts. This type of noise can be easily eliminated by repairing the set or by taking proper care.

This handbook is intended to describe the source of external noise, route of noise through which the noise is picked up by the set, and countermeasures to be taken. (Op Cit. How To Suppress, p. 4)

Another modified cloze teaching technique is the "lexical cloze". Lexical is defined as relating to words of a language. The lexical cloze involved deletion of words according to the

kinds of words they are, such as nouns, verbs, adjectives, etc. A later segment of this article develops case grammar modifications utilizing the lexical cloze, establishing applicability for occupational education reading intervention. The example which follows illustrates use of verb deletions in a radio check application. The words to be deleted have been underlined:

LOAD COIL ADJUSTING PROCEDURE

Adjusting the load coil band up or down lengthens or shortens the antenna electrically. Moving the band upward on the load coil shortens the antenna; lowering the band lengthens the antenna.

1. Using the readings observed in Step 5 under "SWR CHECK" determine which way to turn the load coil adjusting band from the chart below.

2. With antenna fully extended (refer to Step 4 under "SWR CHECK"), wrap protective tape around the load coil above the adjusting band and being very careful not to apply excessive pressure hold the main body of the load coil with a pair of pliers. Using a second set of thin jaw pliers carefully turn the adjusting band 1/8 to 1/4 turn in the direction determined in Step 1. Be careful not to damage the adjusting band threads.

   IMPORTANT: The adjusting feature on the load coil is extremely sensitive and adjustments should be made in small increments.

3. With CB radio on and turned to Channel 12 (23 channel radio) or channel 20 (40 channel radio), key the microphone and recheck SWR. Continue to adjust band as required until the lowest SWR reading is obtained on channel 12 (channel 20 on 40 channel radio) and channels 1 and 23 or 1 and 40 are nearly equal.

4. After adjustment is completed, use a small amount of "Loctite" to lock the adjusting band in position. (Op. Cit. Service Manual for "Slimline," p. 11)

Note that only the verb's involving an action of the part of the student have been marked for deletion. It is the activity that is emphasized in this reading intervention exercise.

When used as a teaching technique, the cloze procedure is easily adapted to provide for increasing degree of difficulty. Often vocational students have experienced a history of failures in reading. The pattern is conducive to diminished motivation in an attempt to read. In order to break the pattern and increase the likelihood of a motivated reader, a pattern of reading successes is useful. Literature of any level of readability can be clozed. Thus, vocational literature at a low readability level can be used for those students who need a success stimulus. In addition, for teaching purposes, synonymous or words close to the correct word can be accepted. The number of clozed words can be decreased, instead of following a schedule. The next example illustrates this point:

IMPORTANT SAFETY NOTICE

> There are special components used in Panasonic TV sets which are important for safety. These parts are shaded on the schematic diagram and on the replacement parts list. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent X-RADIATION, shock, fire, or other hazards. Do not modify the original design without permission of Matsushita Electric. (Op. Cit. Service Manual, Color Television, p. 2)

For the word "diagram," the student would be correct inserting "drawing" or "picture" for example. Note that only five deletions have been made and all are heavily clued.

CASE GRAMMAR AND THE CLOZE PROCEDURE

Gibson and Levin (1979) describe Fillmore's theory of case grammar. ". . .which imaginatively combines syntactic and semantic features." The study of meanings (semantics) and the orderly system of words (snytax) combine in Fillmore's Case Concepts (Brown, 1973). The theory of case grammar is easily adapted to teaching techniques using the cloze procedure. The following illustrations from Electricity and Electronics (Gerrish and Dugger, 1977).

Agentive (A) - "The typically animate, perceived instigator of action."

The scientist tells us that everything is made up of matter (p.7).

Instrumental (I) - "The inanimate force or object casually involved in the state or action named by the verb."

A negatively charged mass will be attracted by a positively charged mass (p.9).

Dative (D) - "The animate being affected by the state or action named by the verb."

Every young man is familiar with the story of Benjamin Franklin and his kite (p.15).

Factive (F) - "The object or being resulting from the state or action named by the verb."

The student may construct several voltaic cells to demonstrate this action (p.15).

Locative (L) - "The location or spatial orientation of the state or action named by the verb."

This type (capacitor) is found in the power supply of radio transmitters and other electronic equipment (p.99).

Objective (O) - "The semantically most neutral case: anything representable by a noun whose role in the state or action named by the verb depends on the meaning of the verb itself."

This kind of capacitor (electrolytics, can type) employs a different method of plate construction (p.99).

Benefactive (B) - "A noun deriving benefit of the action of the verb."

The main advantage (to tubular electrolytics) is the smaller size (p.99).

Comitative (C) - "In accompaniment".

As the motor armature rotates, the current in the armature windings is periodically reversed due to commutator action (p.131).

Temporal (T) - "When the verb is accomplished or occurs."

No current will pass through the diode when the plate is negative in respect to the cathode (p.167).

Modified cloze techniques can be used as introductory exercises, included in self-instruction packets, adapted for games, or structured for remedial work. They provide an excellent method of coordinating in-class vocational work and English or remedial reading treatment.

Exercise 4

Underline each word in the following passage which could be clozed by Fillmore rules, entering above the word the letter which indicates the rule used.

An MPU Self-Test occurs on power-up. Positioning the ON-OFF switch on the game to the "ON" position initiates the test. Successful completion of the test is indicated by seven flashes of the LED (Light Emitting Diode) on the module. Figure A4-1 directs the serviceman to the proper entrance point in the diagnostic table for less than seven flashes. It is necessary to read, understand, and follow the procedure step-by-step until a cause for the problem is determined and the remedy for the problem, as given in the procedure, is put into effect. The few minutes spent to read and understand the procedure will prevent problems and save time later.

During certain steps in the procedure, it is necessary to determine the condition of the address, data & read/write lines (bus). Each line is examined for the following faults: Inputs 'stuck' high or low (shorted to ground), shorts to adjacent leads and continuity between devices on the bus. The procedure also examines the status (good or failed) of several decoding integrated circuit inverters, buffers and gates on the A_g-A_{12} address lines. To accomplish this testing with the use of a voltmeter, bus lead connection points are provided by means of J5. Continuity between

devices on the bus is ascertained by the use of Table A4-1 (or the schematic) and a voltmeter. (Module and Component Replacement. Bally Electronic Pinball Games Repair Procedures. Bensenville, Illinois: Bally Manufacturing Corporation, June 29, 1978, p. 25)

READING VOCATIONAL TEXTS

The following four sections each present a set of important content reading skills. Only those skills particularly relevant to vocational texts have been included. Moreover, each skill has been broken down into segments requiring no more than 5-10 minutes of class time every other day. All homework utilizes the text assignments you would normally require at that point in your course. Because students must pay careful attention to their text in order to complete the reading skill assignment, they should more thoroughly understand the content material than they ordinarily would.

Each section presents the given skill using a variety of vocational examples. Opportunities are then provided for you to apply the skills so that you can be assured of mastering each one.

Following the individual skill discussions is a section called "Textbook Application." It is here that you apply each skill to your own course textbook. This second application accomplishes three purposes: 1) It allows you to locate examples and sample exercises that you can use in your classroom, thereby greatly reducing extra preparation time reading instruction might entail; 2) It enables you to tailor the skills to your text; and 3) It gives you an additional practice opportunity, this time using the same materials your students will use.

At the end of each section are additional suggestions for teaching the new skills.

SECTION 3-6 TIME FRAME

SECTION		TIMING
3	Basic Vocabulary Skills	Weeks 1 and 2
	Formal definitions	
	Synonyms	
	Illustrations	
	Glossaries	
	Textbook application	
	Teaching students basic vocabulary skills	
4	Paragraph Comprehension	Weeks 3,4, and 5
	Paragraph subject	
	Paragraph main idea	
	Textbook application	
	Teaching students paragraph comprehension	
5	SQYR	Weeks 6,7, and 8
	The SQYR method of study	
	Textbook application	
	Teaching SQYR	
6	Recognizing and recording complex information	Weeks 9,10, and 11
	Classification	
	Comparison	
	Cause and effect	
	Textbook application	
	Teaching students to recognize and record complex information	

Section 3

Vocabulary Skills

Central to radio and television is its specialized technical vocabulary. Complete and rapid comprehension of this vocabulary is imperative for the student. This is particularly important because authors of occupational literature assume their readers have a basic understanding of important terms. Since it is essential for students to understand the technical terms in their field, most textbook authors have taken care to provide definitions and other comprehension aids. The simplest of these is the use of italics or boldfaced type to highlight important terms. Four other aids are discussed below: formal definitions, synonyms, illustrations, and glossaries. In some instances, these aids are also used in the occupational literature.

Formal Definitions

Often, an author will define an important technical term in the sentence or sentences that introduce it.

> The luminance signal is the portion of the color picture signal utilized by monochrome receivers. (Sams, 1977, 33)

term	definition
luminance signal	portion of color picture signal utilized by monochrome receivers

Clue words warn the reader that a definition is included in the sentence. These include "is," "means," "is referred to," "is called," and "is defined as." Locate the technical term and its phrase or arithmetic definition in the following examples (remember that a technical term may include one word or several).

Exercise 5

Audio rectification is the detection of modulated RF signals by the audio circuit of a radio or TV receiver, preamp or amplifier, phone, tape recorder, etc. which are heard as unwanted or disturbing audio signals. (Consumer Electronics Show, 1977, 1)

term	definition
_____	_____
	_____

But to understand the motor theory you must realize that as a motor is rotating, the armature and conductors are cutting across the magnetic field and voltage is induced. This is named COUNTER ELECTRO MOTIVE FORCE OR CEMF. (Gerrish and Dugger, 1979, 161)

term	definition
_____	_____
	_____

A FARAD (F) is the capacitance which will cause one ampere of charging current to flow when the applied voltage is changing at a rate of one volt per second. (Ibid., 129)

Expressed mathematically:

$$C = \frac{i}{\Delta v / \Delta t}$$

where,

C is in farads

i = charging current

Δv = the change in volts

Δt = the change in time in seconds

	term	definition
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

No perfect machine has yet been built. There are always some losses between input and output. For a transformer:

$$\text{Percent of efficiency} = \frac{P_{out}}{P_{in}} \times 100$$

Losses are dissipated in heat. These losses have been discussed earlier in the chapter. (Ibid., 123)

term	definition
_____	_____

Synonyms

As an alternative to a formal definition, a text may clarify a technical term by the use of a synonym. The synonym may be enclosed in commas or parentheses directly following the term, or separated by dashes (---).

The composite color signal has a number of requirements; not only must it carry color information, but it must also be compatible with the long-established system of monochrome (black-and-white) television. (Sams, 1977, 23)

term	synonym
monochrome	black and white

Exercise 6

> Manufacturers have adopted a standard EIA (Electronic Industries Association) color-coding system for determining resistance or ohmic values of low-powered resistors. (Zbar, 1966, 1)

term	synonym
_____	_____

> The other half of the colorimeter screen was then illuminated selected by the observer with spectral hues of the three additive primaries -- red, green, and blue. (Sams, 1977, 17)

term	synonym
_____	_____

Illustrations

Sometimes radio and television literature makes use of illustrations to define important terms. Unfortunately, students often skip over the illustrations when they're reading. The first task of an instructor is to impress on students the need to immediately study the designated figure whenever it is mentioned in the prose (Figure 1-1). In the following example, anatomical terms are explained by an illustration.

> The structure of the eye is similar in many respects to a mechanical instrument. The eye consists essentially of a lens system, a variable diaphragm, and a screen. The variable diaphragm is the iris of the eye, and the screen is the retina. The structure of the eye is shown in Figure 1-1. Light enters the eye through a transparent layer called the cornea. The amount of light

that is allowed to strike the lens is controlled by the contraction and expansion of the iris. During a low light level, the iris expands, and during a high light level, it contracts. The light passes through the pupil, which is the aperture of the iris, and then through the lens, which is directly behind the iris. There the light is broken up and is focused to form an image on the back wall, or retina, of the eye. The light on the retina stimulates nerve terminals which are called rods and cones. These rods and cones are connected to the brain by a group of nerve fibers called the optic nerve. This nerve furnishes the path by which the light impulses are transferred from the eye to the brain. (Sams, 1977, 9,10)

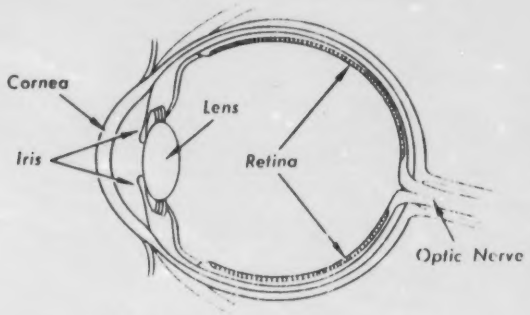


Fig. 1-1. Structure of the human eye.

A large portion of the illustrations used in radio and TV literature incorporate common electrical symbols. Generally, these symbols are defined once or twice and then used throughout the rest of a textbook. In the occupational literature, it is often assumed that the reader understands the symbols and no definitions are given. Therefore, it is important the students learn the definitions when originally presented and then take care to apply them (and thereby understand the example) in succeeding diagrams. For example, Garrish and Duggar (1979, 119-120) present some common transformer symbols on one page of their text and then proceed to use them, without further definition on the next page.

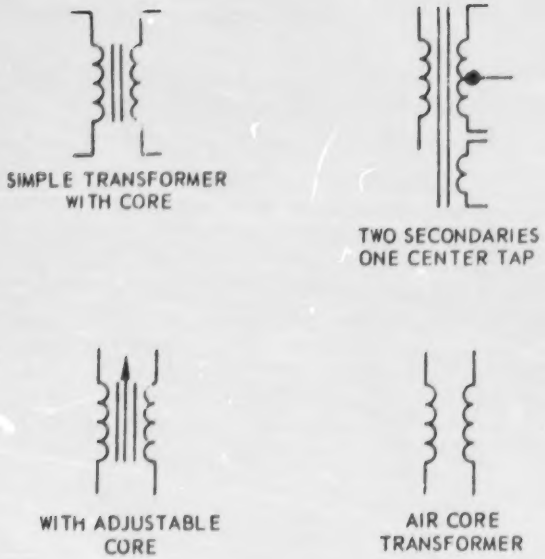


Fig. 8-24. Some common transformer symbols.

On the next page:

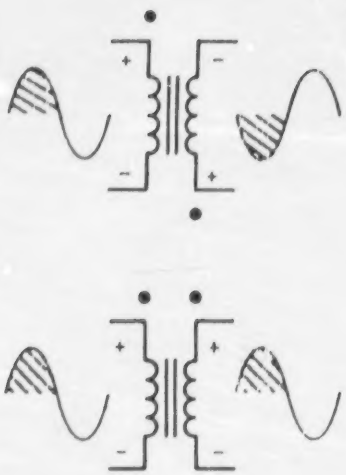
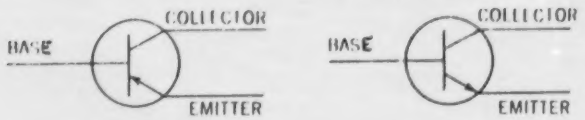


Fig. 8-26. Wave form relationships between input and output of a transformer.

The following paragraph and diagram from Zbar (1967, 64) introduce students to common transistor symbols.

> The schematic symbols for a P-N-P and an N-P-N transistor are shown in Figure 13-10a and b, where the element with the arrow is the emitter and its symmetrical counterpart is the collector. The P-N-P transistor is characterized by the fact that the emitter arrow points to the base, whereas the arrow points away from the base in the N-P-N type. Note that electron-current flow inside the transistor is *opposite* to the direction of the arrow.



(a) (b)

Fig. 13-10. Schematic symbol for (a) P-N-P; (b) N-P-N transistors.

To reinforce the recognition of electrical symbols, students can be required to keep a "vocabulary" list of symbols and their definitions. The act of drawing and labeling the symbols will help students remember them.

Glossaries

Many current radio and television texts include glossaries at the end of the chapter or book. The teacher's task is to make sure the students use this aid. In the initial weeks of a course, students can be required to read the glossary the night before beginning a new chapter. Initially, as they read the chapter and encounter a new word defined in the glossary, they can note it on a separate piece of paper. While the notation is not important in

itself, the requirement of writing it will force them to actively use the glossary. This requirement and the assigned previewing can be relaxed later in the term.

Exercise 7: Textbook Application

Select an introductory chapter from the vocational text you teach. Look for the vocabulary comprehension aids introduced above.

Formal Definitions

Pg. #	Term	Clue word	Definition
1			
2			
3			
4			

Synonyms

Pg. #	Term	Definition
1		
2		
3		
4		

Illustrations

Pg. # term	Pg. # Ill.	Terms defined by the drawing or photograph
1		
2		
3		
4		

Glossary

Pg. #	Terms found in the glossary (use each term only once)
1	
2	
3	
4	
5	
6	

Teaching Students Vocabulary Skills

Vocabulary skills can be introduced in the first week or week and a half of class. Every-other-day one skill can be explained and an example given. Three or four more examples can be given on a transparency, ditto, or the board while the class locates the term and definition in a discussion. As part of their regular homework assignment, have students practice these skills. Select five words that you know are explained by the skill taught that day (synonym, formal definition, etc.). Have students prepare a sheet similar to the one you completed in the preceding text application section.

The cloze technique can also be used to reinforce or check the basic vocabulary skills. Prepare a clozed selection from your text, omitting important technical terms that are explained by one of the techniques discussed. This can be used to determine whether students use these comprehension aids or know the vocabulary. It can also be used to demonstrate to them the usefulness of learning these skills.

Section 4

Paragraph Comprehension

A paragraph has three major components:

1) the subject (what is being talked about)

2) the main idea (the most important information about the subject)

3) the supportive information (facts or examples that make the information clearer)

Of these, the main idea is the most crucial, for the key points of a chapter or article are simply selected main ideas from component paragraphs.

Look at the following paragraph about noise AGC (Panasonic, (a), 17). What are the subjects and the main ideas?

> The noise AGC Circuit functions to gradually reduce the noise detection ability as the frequency of occurrence of noise increases. When white noise increases in a medium-weak electric field, the white noise causes the gate to open frequently, and it will cut the audio signal more often. Then the signal/noise ratio becomes worse. It is for this reason that negative feedback is applied to the noise detector when white noise increases in a medium-weak electric field, so that only pluse-like noises which are relatively great are detected.

It looks as though the subject here is AGC Circuits. However, there are many things about AGC Circuits that are not discussed (e.g., design). It is really only talking about the "function of AGC Circuits." What is the most important information about the function of AGC Circuits? -- that they reduce unwanted noise by applying negative feedback to the noise detector.

Paragraph Subject

The key to finding the subject of a paragraph is finding the one topic that everything else in the paragraph is related to. A paragraph usually discusses only one small aspect of a larger topic, therefore, the subject must not be too general. It must identify the specific topic being discussed. At the sametime, it must not be too specific, substituting an example of the subject being discussed for the subject itself.

Read this next paragraph from an electricity text and look for its subject.

> The law of conservation of energy states that energy cannot be created or destroyed. However, energy can be converted from one form into another. Electric energy in the form of a flow of electrons can, for example, be converted into heat energy, light energy, chemical energy, or magnetic energy. (Buban and Schmitt, 1972, 2)

Subject: a) energy
b) conservation of energy
c) electric energy

Immediately, choices "a" and "c" can be eliminated. It can be seen that "a" is too general, since the paragraph only touches on one small aspect or energy. However, "c" is too specific; the paragraph simply discusses electric energy as an example of the conversion of energy from one form to another. It follows, then, that "b" is the correct answer.

Paragraph Main Idea

Often it is difficult to identify a paragraph's main idea. The following four guidelines can help in its location:

1. If the paragraph includes the definition of a term, that term might be part of the subject. The definition might be part of the main idea.

2. If there are examples, these may be illustrating all or part of the main idea.

3. If a key word or phrase is repeated, it might be part of the subject or main idea.

4. Highlighted words might be part of the subject or main idea.

Look at the following paragraphs. First, ask yourself what the paragraph is about (the subject). Then look for the main idea using the four guidelines. Note which guideline is most helpful in each case (in some cases none may apply).

Exercise 8

Remember that the main idea contains the most important information about the subject. This information may be clearly stated at the beginning or end of the paragraph, scattered throughout, or merely inferred.

> A typical variable capacitor will have a screw on its side, which is another small capacitor in parallel with the larger variable capacitor. This little TRIMMER CAPACITOR is used to make fine adjustments on the total capacitance of the device. The trimmer capacitor will have small flexible metal plates separated by mica or some other dielectric. By turning the screw inward, the plates are compressed and its capacitance is increased. (Garrish and Dugger, 1979, 130)

Guideline #	Subject	Main Idea

Caution: No modification of any circuit should be made that would expose the user to a potential hazard. No modification of any circuit should be attempted unless specifically authorized by the manufacturer. Service work should be performed only after you are thoroughly familiar with all of the following Safety Checks and Servicing Guidelines, plus, any other special ones contained in the Service Information for the specific product. To do otherwise may create potential hazards and increase the risk of injury to the user. (Consumer Electronics Show, 1977, 10)

Guideline #	Subject	Main Idea

A filter in a general sense is simply a device which allows the desirable to pass through it and prevents the undesirable from doing the same. Hence, an air filter is intended to pass only air and to prevent the passage of dust, dirt, etc. Water filters, oil filters, etc. function in a similar fashion. The quality of the filter determines just how successful it is in preventing the passage of the unwanted substance. Filters used in electronics perform their intended function by permitting the passage of desired "frequencies" and reducing the magnitude of undesired frequencies which can pass through. It is important to note that a filter, regardless of quality, does not eliminate interference. Fortunately, elimination of the interfering signal is not required in order to eliminate the "effect" of the interference. (Miller, January 1980, 1)

Guideline #	Subject	Main Idea

Current flowing in a conductor produces a magnetic field around the conductor. When this current carrying conductor is placed in a fixed magnetic field, the two fields add together on one side of the conductor and oppose each other on the opposite side. As a result, the conductor will move toward the weakened

field. This is called MOTOR ACTION. The principle will be used again in your study of MOTORS. (Garrish and Dugger, 1979, 94)

Guideline #	Subject	Main Idea

The chemical activity that takes place at the carbon electrode releases hydrogen gas. A condition known as *polarization* could develop if the hydrogen gas collected around the carbon electrode. Should hydrogen collect around the carbon electrode, the output voltage would be reduced because the hydrogen partially insulates the carbon rod from the electrolyte. However, the presence of a depolarizer (Manganese dioxide) contributes oxygen which combines with the hydrogen to form water. The water produced by the depolarizer and hydrogen also serves the purpose of keeping the electrolyte moist. (Burke, et al., 1970, 268)

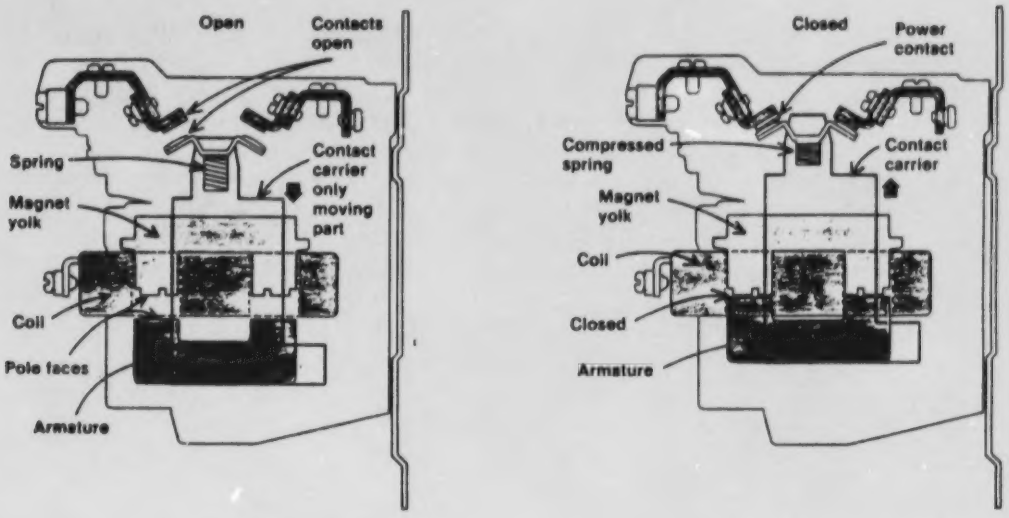
Guideline #	Subject	Main Idea

Paragraph Comprehension and Illustrations

Paragraph comprehension can be reinforced by the proper use of illustrative material, as the following examples show as with illustrated definitions, students must be taught to relate the illustration and the prose.

This illustration shows the contact carrier in the open and closed positions. Note, the angled contacts and the short travel required for the movable contacts to bridge the stationary contacts. In the open position, the movable

contacts are held in accurate alignment with the stationary contacts by the movable contact carrier. When the coil is energized, the magnet closes. As the contacts meet - and before the magnet pole faces seat - the movable contacts are released from their support, so that, no wear causing side motion is transmitted to the movable contact. The movable and stationary contacts are set at an angle, so that they hold firmly in place when closed. Contacts do not twist or slide during seating; contact wear is effectively reduced and life is increased. (Allen-Bradley, September, 1976, 5)



82

The monostable multivibrator consists of a combination of a zener diode and a Schmidt trigger. It is designed to produce the control pulse to open the gate for the necessary time according to the output of the noise detector.

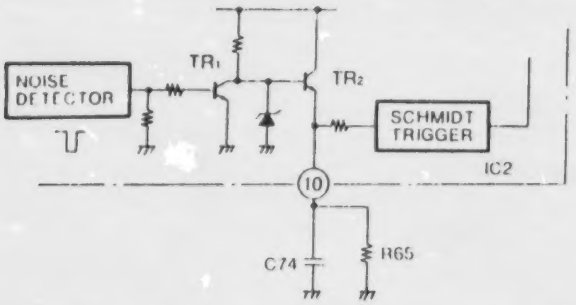


Fig. 25 Monostable multivibrator basic circuitry

When a negative-going pulse, corresponding to the noise, is applied to the base of TR_1, it turns TR_1 off. The voltage on pin (10) of IC_2 increases to about 6.5 V, (set by the zener diode, and C74). When there is no input from the noise detector, TR_2 turns off, and TR_1 turns on. Capacitor charge becomes discharged because of C74. (Panasonic, (a), 17)

Exercise 9: Textbook Application

Pick four paragraphs from your third week's reading assignment. Identify the subject in each.

Page #	Column #	Para. #	Subject

Pick four paragraphs from your fourth week's reading assignment. Identify the subject and main idea in each.

Page #	Col. #	Para. #	Subject	Main Idea

Pick a segment at least four paragraphs in length from your fifth week's reading assignment and note the subject and main idea of each important paragraph.

Page #	Subject	Main Idea

Select three illustrations from the fifth or sixth week's text assignments and note the page, column, and paragraph number of the prose section that is illustrated by a diagram.

Page #	Col. #	Para. #	Page # Ill.	Title of Illustration

Teaching Students to Understand the Paragraph

Understanding the paragraph is the most difficult reading skill the vocational instructor must teach. It is important to introduce the material slowly and incrimentally as was done here. The third-week of class can be devoted to the paragraph subject. Monday 5-10 minutes can be spent in a general introduction and discussion/practice locating subjects in simple sample paragraphs. Wednesday, the three criteria can be applied to more sample paragraphs and students can look for the subject in specified paragraphs from the homework reading. Friday, a few of the homework paragraphs can be discussed and one or two more complex samples given. Friday's homework can include 1-3 more paragraph assignments.

During week five, a similar procedure can be utilized to teach locating the main idea. Each day one of the four clues can be introduced and applied along with the more general directions of "what is the most important thing the author is saying in this paragraph." The paragraphs you identified in the text application section can be assigned to the students with directions to find the subject and main idea. In the fifth or sixth week, the class can be assigned the multiparagraph sections you identified, recording the subject and main idea just as you did. They can also locate prose sections that are illustrated by diagrams.

Section 5

EFFECTIVE READING TECHNIQUE

In all subjects, the time comes when we ask our students to study by themselves. In many instances, these students do not know how to study. This section contains a brief overview of a study technique originally devised by Francis Robinson (1970).

The SQ4R Method of Study

Many elementary, secondary, and college students have not learned how to study a textbook assignment. A typical procedure is for the student to do nothing more than open his book and read the assignment. The more conscientious may follow this initial reading by a second or even a third reading of the same fruitless type. Research has found a good method of helping the student read a given selection with better understanding and better recall. It is called the SQ4R method. It involves five basic steps: (1) Survey, (2) Question, (3) Read, (4) Recit, (5) Review. Some of the things to be done in each of the five steps are discussed under appropriate headings below.

Survey:

> Look through the whole assignment. Read the headings if there are any; read the summary if there is one. Try to get the general idea of the content of the whole lesson. Later you can piece the details into the framework which you have in mind, and the entire lesson will mean more.

Question:

Think of the questions which are likely to be answered in the lesson. Often the headings can very easily be turned into questions. Use them! If any heading does not tell you plainly what question is to be answered in that section use this question: "What does the author expect me to learn about from studying this section?" If there are no paragraph headings, skim the section quickly for the main ideas.

Read:

Study the lesson to find the answers to the questions. Do not stop to read every word carefully, concentrate on finding the main point. You cannot remember all the facts you find, so you want to look for the important ones, of which there will be only one or two for each section. Don't pick out too many. Do not try to memorize the facts at this point; just sort out the ones you need as you go along.

Make study guides. Fold or rule a large-sized notebook paper lengthwise down the middle. On the left, list the topics discussed in the book. If there are paragraph headings in boldface type, use them. If not, list the main ideas found in the preliminary survey. Leave space between topics. When you have finished reading a section and picking out the one or two points to remember, list on the right the key words of the ideas or facts you have decided are most important for each topic. Do not do this until after you have read a section and thought about it. This is most important.

Recite:

Go back over the lesson immediately. Cover the right hand side of the paper and check the headings on the left. Ask yourself, "Do I remember what this section was about?" or "Can I answer this question?" If you find that you cannot you know that you must look at the key words, or even go back to the book if necessary, in order to restudy the particular part which you did not understand or have forgotten. Step 4 is very important. Giving yourself an immediate quiz on what you have just studied is the best possible way to prevent forgetting.

Practice until you can recite on the entire study guide without referring to the key words. Then practice some more. This extra practice is what really pays off.

Review:

Some time later, and always before an exam, go back to your headings and questions and quiz yourself. Reread only those parts which you have forgotten. If you have taken steps 1, 2, 3, and 4 faithfully, you will find that you do not have too much to restudy.

If students learn to change the headings within a chapter to questions and then read to answer those questions, much more will be obtained, than if they merely read and then answered questions at the end of the chapter. Indeed, what often takes place when we assign questions from the chapter ending is students read the questions and then copy only that information which answers the question without ever having read the chapter or designated pages. The process of formulating questions is a thinking exercise which tunes students into the assignment. Reading, studying, in this way is a life-long skill that really should be taught. As a skill, it may be more important than the content and concepts of the subject.

Occupational Literature Application

The occupational literature in data processing consists heavily of computer-generated user's guides. These generally include a detailed table of contents and a number of short, titled, topics per page. Seldom do users read the entire quide at one time. Rather, they use only those sections needed to solve

a particular problem. Efficient use of surveying techniques (1. surveying the table of contents, and 2. skimming subtitles) can facilitate this process.

Exercise 10: Textbook Application

Select a portion of the chapter you assign in the seventh or eighth week of class and practice the SQ4R method.

Teaching SQ4R

Students have already learned how to locate the subject and main idea of a paragraph and how to distinguish these from information that is merely supportive. In the final "paragraph" assignments they practiced recording information in much the same manner as they will for SQ4R. This should facilitate SQ4R instruction. On Monday explain surveying and have the students practice in class on the chapter currently assigned. Wednesday have them prepare questions from some of the headings, either individually or as a group. They can continue this exercise for homework. Friday the read and record steps can be presented and compared with the subject/main idea work they have already done. Reading and recording can be practiced on the homework assignment and discussed the following Monday.

Teacher-made notes on the reading can be shown on a transparency, on the board, or a ditto to allow students to check their own notes. Wednesday the recite and review steps are introduced with students pairing-up to quiz each other from the left-hand subject

column. Beginning Wednesday night, they should be expected to utilize the SQ4R method on their assignments. The next two Fridays, and sporadically thereafter, students can quiz each other on their notes while the instructor walks around the room noting whether each student has followed the correct procedure. At the beginning of the next chapter, students should again be required to perform the survey step in class and suggest some guide questions derived from the chapter headings. Review of the other steps should take place as needed.

Section 6

Recognizing and Recording Complex Information

Radio and television literature often highlight three important logical relationships: classification, comparison, and causality. Classification, in its simplest form is simply listing.

> Inductors and transformers make up another classification of components. Wire-wound coils and chokes are classified as inductors. These are wound on different forms and cores. Thus, there are air-core coils, iron-core, powdered-coil, etc. (Zbar, 1966, 1)

Comparison and causality are straightforward and commonplace. Different types of coil construction for RF inductors may be discussed in one article while another presents common causes of, and solutions to interference. These three relationships are easiest to see and remember if the notes taken about them have a visual impact. Each of these charting techniques, as well as signal words that can alert the reader to such relationships are given below.

Classification

The use of classification can be signaled by a colon(:), number or letters, or words such as "these include." At other times, classification is simply introduced by a statement: "there are a number of types of RF chokes." Outlining is the easiest way to record classification.

Color Mixture

The production of color may be accomplished by either of two processes. When working with paint pigments, the subtractive process is employed. The other process of mixing colors is called the additive process. This is the process that is employed in color television. These two methods of producing color are rather different. It might be said that the additive process is just the reverse of the subtractive process.

The subtractive process is dependent on incident light. Light falling upon a painted picture reflected or absorbed. If a certain section of the picture is treated with a red pigment, the light that is reflected is predominantly in the red region of the spectrum and the section will appear red.

The additive process of color mixing used is color television employs colored lights for the production of colors. The colors in the additive process do not depend on an incident light source. Self-luminous properties are characteristic of the additive colors. Phosphorescent signs, which glow in the dark, are good examples of this process. Cathode-ray tubes contain self-luminance properties, so it is only logical that the additive process would be employed in color television. (Sams, 1977, 14)

I. Color Mixture
    A. Subtractive process
        1. incident light
        2. pigment reflects light of desired color

    B. Additive Process
        1. colored lights
        2. self-luminous
            a. phosphorescent
            b. cathode-ray tubes

Exercise 11

Construct an outline for the following selections.

Power transformers used in electronics perform several functions. First, to step up or step down the a-c line

voltage, which is then rectified and changed into d-c voltage. Second, if the electronic device served by the transformer contains vacuum tubes, the transformer is used to step down the line voltage to a value required to supply the filaments of the tubes. Third, the transformer serves to isolate windings from each other. (Zbar, 1967, 31)

Outline:

Metallic materials such as wires, strips, and sheets, and other materials, (gas or liquid) that are suitable for carrying electric current are called *conductors*. The actual movement of the electrical energy along the conductor is called conduction. Conductance is a measure of the ability of a material to conduct an electric current. It is the reciprocal of resistance, and its unit of measure is the mho ("ohm" spelled backward).

Normally a conductor has a very low resistance. The resistance value in ohms for a conductor depends on the kind of metal, cross-sectional area, and length. For example, a 100-foot length of No. 14 copper wire has a resistance of about 1/4-ohm.

Some materials offer a very high resistance to the flow of electricity. A few examples would be paper, glass, rubber, and plastics. Instead of being called high-resistance conductors, they are called *insulators*. These materials have resistance values of several million ohms and higher. Other materials have resistance values that are somewhere between the resistance of a good conductor and the very high resistance of a good insulator. These materials, such as carbon, silicon, and germanium, are known as *semiconductors*. Each of these main classes of conductors will be covered in this discussion. (Burke, et al., 1970, 192)

Outline:

Comparison

While classification is commonly used in radio and television literature texts, it is seldom used alone. Once the elements of a topic have been classified into sub-topics, these sub-topics are usually compared. Charts with the topics to be compared along one axis and the features of comparison along the other facilitate retention, which is the reason important comparative information is often presented in a chart form.

RESISTANCE ELEMENT	RESISTANCE RANGE	TOLERANCE	TAPERS	POWER RATING (LINEAR TAPER) SERIES 70	SERIES 72	SERIES 73
Hot Molded Composition	50 ohms to 10 megs	±10% or ±20%	Linear (U)	1 0 Watt at 70°C	0 5 Watt at 70°C	0 75 Watt at 70°C
	250 ohms to 10 megs		Modified Log CW (A) or CCW (B)			
Cermet	100 ohms to 5 megs	±10%	Linear (U)	2 0 Watts at 70°C	1 0 Watt at 70°C	2 0 Watts at 70°C
	250 ohms to 1 meg		Modified Log CW (A) or CCW (B)			
Conductive Plastic	100 ohms to 1 meg	±10% or ±20%	Linear (U)	0 5 Watt at 70°C	0 25 Watt at 70°C	0 5 Watt at 70°C
	500 ohms to 1 meg		Modified Log CW (A) or CCW (B)			

(Allen-Bradley, 1/79, Cover)

Description		Dimension "A" in Inches											
		Units with Quick Connect Terminals						Units Having Screw Terminals with Pressure Plates					
		Push Button	Pilot Light	Sel Switch	Cyl Lock	Potentiometer	Push Pull	Push Button	Pilot Light	Sel Switch	Cyl Lock	Potentiometer	Push-Pull
Non-Illuminated		2 1/4 [1]	—	2 15/32	3 1/2	2 11/32	2 1/4	2 5/16 [1]	—	2 17/32	2 1/16	2 11/32	2 5/16
Illuminated	Full Voltage	2 1/4	2 1/4	2 15/32	—	—	2 1/4	2 5/16	2 1/4	2 17/32	—	—	2 5/16
	Transformer	2 17/32	2 23/32	2 29/32	—	—	3 1/32	2 25/32	2 23/32	2 33/32	—	—	3 5/32

[1] Includes Dual Operator Push Buttons

(Allen-Bradley, 9/78, 7)

Because charts can simplify complex comparisons, students should practice constructing their own charts. Care should be taken during such construction to read the entire relevant section before beginning the chart. As a simple example of comparison charting, a 2 x 2 table has been constructed from a short paragraph by Burke, et al. (1970, 265)

> There are primary and secondary types of cells. Once a primary cell is discharged it is no longer usable. The chemical action that discharged the primary cell *cannot be reversed*, and it *cannot be regenerated* as a source of electric power. The *secondary* type of battery cell *is rechargeable*. The chemical action is reversible; the electrodes and electrolyte can be restored to the same makeup that existed before the discharge.

Type of Cell	Chemical Action
Primary	Cannot be Reserved
Secondary	Reversible

Exercise 12

On a separate sheet of paper construct a comparison chart for the two selections below:

Selection 1

Scientific interest in semiconductors led to the development of the transistor. This semiconductor device can perform practically all of the functions of the vacuum tube, such as amplification, detection, and oscillation. One advantage of the transistor over the vacuum tube is that it is small and light, permitting miniaturization of electronic equipment. It is solid. Therefore microphonics are not a problem as in vacuum tubes. It has no filaments and therefore does not require filament power. The transistor operates with low supply voltages and uses little power. It does not require any warm-up period and will operate as soon as power is applied. A transistor has fewer circuit connections. Hence, its circuitry is basically simpler than that of a tube. A disadvantage of transistors is their sensitivity to heat, but an advantage is that they do not generate as much heat as tubes. (Zbar, 1967, 61)

Selection 2

Types of Coil Construction

R.F. inductors can be manufactured in a number of basic winding configurations. Each of these types has its advantages depending on its function in a circuit and the associated components.

Solenoid or single-layer winding is used in the simplest type of coil (Figure 1A). This coil becomes a true air inductor when the winding is self-supporting. This type of winding provides the least amount of inductance in a given space. However, it produces a very low value of distributed capacitance and allows excellent heat transfer since air can move over the entire winding area. Magnetic or non-magnetic core material can be used to support the winding and to provide a means of mounting the start and finish leads. The core can also be made adjustable to vary the amount of inductance.

A *multi-layer-wound coil* (Figure 1B) realizes an appreciable increase in the amount of inductance over that of a single-layer-wound coil. Turns are wound on top of each preceding layer to build up coil diameter by adding layer on layer. This permits the maximum amount of inductance.

Layer winding is satisfactory at low frequencies. However, even at the higher audio frequencies, the effect of the large distributed capacitance between turns can affect circuit operation significantly by limiting frequency response.

Before the development of the universal winding method, great efforts were made to divide windings into sections or pi's by means of multi-section forms. This method is still used in the production of windings for use with pot-type cores.

The pi or universal winding provides a larger value of inductance per cubic volume of space than a solenoid, but not as much as a multi-layer-wound coil. The main advantage of a universal coil over a layer-wound coil is a much lower value of distributed capacitance. If we break our coil into a number of pi's, the value of distributed capacitance is lowered still further. This gives the same result as adding fixed values of capacitance in series. Generally d.c. resistance of the inductor will increase because more wire is required to produce the same inductance.

Pi or self-supporting universal winding must be done on a machine while the single-layer or multi-layer winding can be done by hand without the aid of a mechanical device. Basic design parameters of wire size, form diameter, winding width, or cam throw are entered into a number of basic formulas to give ratios that determine rotation of the winding form and wire movement on the coil form. These ratios are related directly to gears in the coil-winding machine that establish an exact relationship to the wire at all points of the form rotation. Since the wire is carried from one side of the form to the other and back again as the form rotates, it is necessary that each turn either progress or retrogress in relation to the preceding turn in order to achieve a mechanically stable coil (Figures 1C, 1D, and 1E).

The universal progressive type of winding was developed to increase the inductance of the solenoid winding and further reduce the distributed capacitance of the pi winding. This is accomplished by laying the pi winding along the form instead of allowing it to build up into a single pi (Figures 1F and 1G). In addition to the calculations for the regular universal winding, gear ratios must be calculated for the progressive movement of the winding on the coil form that is used.

Variable-pitch universal progressive winding is a specialized variation of the universal progressive winding. Whenever a piece of equipment is designed to use permeability tuning, such as most auto receivers, this type of winding is commonly used. The winding is layered on the form to obtain frequency distribution that is either linear or close to linear as the iron core is inserted (Figure 1H). In normal progressive winding a much greater increase in inductance is achieved during the initial movement of the core into the winding than is achieved after the core has entered the winding more fully.

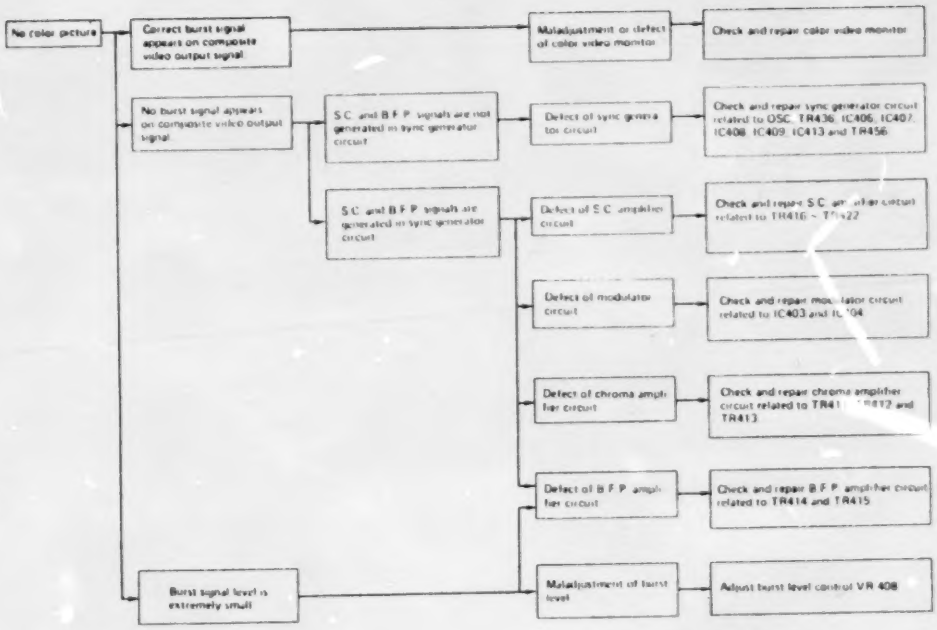
Pot-core winding is a highly specialized layer winding used with a cup-shaped powdered-iron or ferrite core to produce extremely efficient inductors. This type of coil exhibits most of the advantages of toroid coils since the flux is confined almost entirely within the magnetic material Figure 2).

The final choice of wire size, winding pattern, and form material should be left to the coil design engineer because of the knowledge he has gained in designing coils over the years. For example, a specific wire size will carry different amounts of current depending on the winding pattern and core materials for a specific temperature rise. It is very important, however, for the circuit designer to understand what he wants to achieve with a coil, and to pass the requirements on to the coil engineer. (Courtney)

Causes and Effect

Both classroom texts and occupation literature in the field of radio and television devote extended space to troubleshooting mechanical problems in audio and video equipment. Often troubleshooting guides are presented in the form of a flowchart such as the one below. Students must be taught to "read" such charts in the proper sequence.

NO COLOR PICTURE


No color picture
Correct burst signal appears on composite video output signal
Maladjustment or defect of color video monitor
Check and repair color video monitor
No burst signal appears on composite video output signal
S.C. and B.F.P. signals are not generated in sync generator circuit
Defect of sync generator circuit
Check and repair sync generator circuit related to OSC, TR436, IC405, IC407, IC408, IC409, IC413 and TR456
S.C. and B.F.P. signals are generated in sync generator circuit
Defect of S.C. amplifier circuit
Check and repair S.C. amplifier circuit related to TR416 ~ TR422
Defect of modulator circuit
Check and repair modulator circuit related to IC403 and IL 104
Defect of chroma amplifier circuit
Check and repair chroma amplifier circuit related to TR41 TR412 and TR413
Defect of B.F.P. amplifier circuit
Check and repair B.F.P. amplifier circuit related to TR414 and TR415
Burst signal level is extremely small
Maladjustment of burst level
Adjust burst level control VR 408

(Panasonic (b), Trouble Shooting Guide,1[illegible])

They should also learn to construct their own flow charts from prose cause and effect discussions.

Exercise 13

Use the following selection on the loss of monochrome picture (Sams, 1977, 176).

Loss of Monochrome Picture

If the receiver does not produce a monochrome picture when receiving a signal, the cause of the trouble can be located somewhere between the input of the receiver and the output of the luminance channel. Follow the same procedure that is used when troubleshooting for loss of the picture in a monochrome receiver. Since a color receiver is under consideration, the color-bar generator can be used to advantage in isolating the stage or stages in which the trouble exists.

Connect the rf output of the color-bar generator to the antenna terminals of the receiver. If color appears on the screen, it can be assumed that the stages up to the point where the chrominance signal is separated from the composite video signal are operating properly. This means that the cause of the trouble is somewhere between the stage in which the chrominance takeoff point is located and the output of the luminance channel. The color bars on the screen would have improper brightness levels since there would be no output from the luminance channel.

If the receiver has a luminance channel similar to that shown in Figure 11-1, the circuit between the output of the first video amplifier and the plate of the video output tube should be checked. The second video amplifier should be substituted first. A defective video output tube can also cause a loss of the luminance signal. However, a defective video output tube usually cuts off the picture tube, causing a loss of raster. If tube replacement does not eliminate the trouble, an oscilloscope should be used to trace the luminance signal through the circuit. After it has been determined just where the trouble is located in the circuit, the defective component can be isolated through voltage and resistance checks.

If color does not appear when the rf output the color-bar generator is connected to the antenna terminals of the receiver, the cause of the trouble is located between the

receiver input and the point where the chrominance signal is separated from the composite video signal. If the convention methods of troubleshooting are followed, the defective tube or component can be found.

It can be seen from the foregoing discussion that the color-bar generator can be very useful even when troubleshooting the loss of the monochrome picture. Time can be saved if it is known that the color signal is able to pass through the circuit that are also common to the luminance signal.

If the receiver has a luminance channel similar to the one illustrated in Figure 11-2, normal sign; tracing procedures should be used to locate the defective component. (Sams, 1977, 176)

Exercise 14: Textbook Application

Select 3 paragraphs or sections from the text assignments for week nine, ten, or eleven that include each of the logical relationships discussed above and complete a note chart on them on separate paper.

Teaching Students to Recognize and Record Complex Information

Chart notetaking as demonstrated here can be introduced anytime after week six, whenever it is appropriate for your text. The three types of charts need not be presented at the same time. For convenience sake, it is assumed here that all will be introduced during weeks nine, ten, or eleven. Each form should be presented on a separate day. One or two sample paragraphs or sections can be given and the students can construct the charts as a class. Related homework assignments should be given as soon as the appropriate text selections are covered.

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